CLAIMS

What is claimed is:

1. An N×N compressor for serving a connection request to route k incoming signals, k≤N, and for enabling conditionally nonblocking switching, the compressor comprising

a switch defined by a set of connection states and having an array of N input ports with N distinct input addresses and an array of N output ports with N distinct output addresses wherein the k incoming signals arrive at k distinct input ports determining k active input addresses and are destined for corresponding k distinct output ports determining k active output addresses, and

control circuitry, coupled to the switch, for routing the incoming signals from the k distinct input ports to the corresponding k distinct output ports by activating one of the connection states such that the activated one of the connection states accommodates the connection request subject to constraints on the connection request: (1) the k active output addresses are consecutive upon a rotation of the ordering of the N output addresses, and (2) the correspondence between the k active input addresses and the k active output addresses is order preserving after the rotation.

2. The compressor as recited in claim 1 wherein N=2 and the switch is a switching cell.

3. The compressor as recited in claim 1 wherein the switch is constructed by an N×N k-stage switching network composed of k stages of nodes, an interstage exchange between any succeeding two of the k stages, an input exchange and an output exchange, and wherein each node is filled with another switch.

4. The compressor as recited in claim 1 wherein the switch is constructed by an N×N k-stage switching network composed of k stages of nodes, an interstage exchange between any succeeding two of the k stages, an input exchange and an output exchange, and wherein each node is filled with another compressor.

5. The compressor as recited in claim 1 wherein k=2 and the switch is constructed from a two-stage interconnection network composed of a first stage of nodes being the input nodes and a second stage of output nodes being the output nodes, an interstage exchange, and an output exchange corresponding to the interstage exchange

appended to the network, and wherein each node is filled with another compressor.

6. The compressor as recited in claim 1 wherein the switch is constructed from a 2X interconnection network having nodes and wherein each node is filled with another compressor.

7. The compressor as recited in claim 1 wherein the switch is constructed from a 2X interconnection network having nodes and wherein the nodes are filled with a plurality of other compressors.

8. The compressor as recited in claim 1 wherein the switch is constructed from a recursive 2X interconnection network having nodes and wherein each node is filled with another compressor.

9. The compressor as recited in claim 1 wherein the switch is constructed from a recursive 2X interconnection network having nodes and wherein the nodes are filled with a plurality of other compressors.

10. The compressor as recited in claim 1 wherein the switch is constructed from a divide-and-conquer network appended with a SWAP exchange.

11. The compressor as recited in claim 1 wherein the switch is constructed from a recursive 2X interconnection network having nodes and wherein each of the nodes is a cell and each cell is filled with a 2×2 compressor.

12. The compressor as recited in claim 11 wherein the 2×2 compressor is a switching cell.

13. The compressor as recited in claim 1 wherein the switch is constructed from a recursive 2X interconnection network of cells with each cell filled with a 2×2 compressor.

14. The compressor as recited in claim 13 wherein the 2×2 compressor is a switching cell.

15. The compressor as recited in claim 1 wherein the switch is constructed

from a banyan-type network whose trace and guide are both monotonically decreasing and wherein each of the 2×2 nodes of the banyan-type network is filled with a 2×2 compressor.

16. The compressor as recited in claims from 15 wherein the 2×2 compressor is a switching cell.

17. The compressor as recited in claim 1 wherein the switch is constructed from a recursive 2-stage interconnection network of cells appended with a SWAP exchange and wherein each cell of the network is a 2×2 compressor.

18. The compressor as recited in claim 17 wherein the 2×2 compressor is a switching cell.

19. A method for constructing an N×N compressor to serve a connection request to route k incoming signals, k≤N, the method comprising

configuring a switch defined by a set of connection states and having an array of N input ports with N distinct input addresses and an array of N output ports with N distinct output addresses wherein the k incoming signals arrive at k distinct input ports determining k active input addresses and are destined for corresponding k distinct output

ports determining k active output addresses, and

routing the incoming signals from the k distinct input ports to the corresponding k distinct output ports by activating one of the connection states such that the activated one of the connection states accommodates the connection request subject to constraints on the connection request: (1) the k active output addresses are consecutive upon a rotation of the ordering of the N output addresses, and (2) the correspondence between the k active input addresses and the k active output addresses is order preserving after the rotation.

20. The method as recited in claim 19 further including, prior to routing, activating one of the connection states in response to the connection request.

21. The method as recited in claim 19 further including, prior to activating, selecting one of the connection states in response to the connection request.